



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04M 3/00, 11/06		A2	(11) International Publication Number: WO 98/10573 (43) International Publication Date: 12 March 1998 (12.03.98)									
<p>(21) International Application Number: PCT/US97/15450</p> <p>(22) International Filing Date: 3 September 1997 (03.09.97)</p> <p>(30) Priority Data:</p> <table> <tr> <td>08/708,267</td> <td>6 September 1996 (06.09.96)</td> <td>US</td> </tr> <tr> <td>08/740,775</td> <td>1 November 1996 (01.11.96)</td> <td>US</td> </tr> <tr> <td>08/888,406</td> <td>7 July 1997 (07.07.97)</td> <td>US</td> </tr> </table> <p>(71) Applicant: DATA RACE, INC. [US/US]; 12400 Network Boulevard, San Antonio, TX 78249 (US).</p> <p>(72) Inventor: BARKER, William, B.; 9 Inwood Mist, San Antonio, TX 78248 (US).</p> <p>(74) Agent: HOOD, Jeffrey, C.; Conley, Rose & Tayon, P.O. Box 3267, Houston, TX 77253-3267 (US).</p>		08/708,267	6 September 1996 (06.09.96)	US	08/740,775	1 November 1996 (01.11.96)	US	08/888,406	7 July 1997 (07.07.97)	US	<p>(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>Without international search report and to be republished upon receipt of that report.</i></p>	
08/708,267	6 September 1996 (06.09.96)	US										
08/740,775	1 November 1996 (01.11.96)	US										
08/888,406	7 July 1997 (07.07.97)	US										
<p>(54) Title: SYSTEM AND METHOD FOR PROVIDING USER CONNECTIVITY TO A REMOTE DATA SITE</p> <p>(57) Abstract</p> <p>A system and method for enabling a remote user to connect to a remote data site on a communication line, such as a telephone line, wherein the remote user is still able to receive telephone calls from other parties on this same telephone line. This obviates the necessity of the user having to purchase a second telephone line for incoming calls while data communications are being performed, thus reducing access costs. The remote user includes a modem or user telephony communication device configured to connect to a remote data site through the public switched telephone network (PSTN). The communication line or telephone line has a first telephone number. The remote data site includes one or more communication servers which perform intelligent call routing functions. When the user connects to the remote data site on a communication line, either the remote data site or the user telephony communications device performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to a second telephone number pre-assigned by the remote data site. While the user is performing data communications on the communication line with the remote data site, if another party places a telephone call to the remote user, the call forwarding operation causes the telephone call made to the first telephone number to be forwarded to the second telephone number maintained by the remote data site. The communication server at the remote data site then routes the received telephone call to the user telephony communications device using the communication line that is currently being used for data transfers between the user telephony communications device and the remote data site. This obviates the necessity of the remote user having to purchase a second phone line, since the user can perform data communications with the remote data site while still being able to receive telephone calls.</p>												

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NB	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

TITLE:**SYSTEM AND METHOD FOR PROVIDING USER CONNECTIVITY TO A REMOTE DATA SITE**

5

BACKGROUND OF THE INVENTION**10 Field of the Invention**

The present invention relates a system and method which provides connectivity between one or more users and a remote data site over a communication line, wherein the users have data connectivity to the remote data site through the communication line and also 15 maintain telephone connectivity with other parties through the communication line.

Description of the Related Art

In many instances a user desires to connect to a remote data site to obtain data or 20 perform other communications data operations. For example, a user who desires access to the Internet typically connects to an Internet access provider in order for the user to be able to connect to the Internet. In addition, many people who desire to work at home, referred to as telecommuters, desire to connect to the local area network (LAN) at the corporate office in order to retrieve files, obtain data or perform other data access communications functions.

25 When a home user desires to connect to a remote data site, the user data typically uses the standard POTS (plain old telephone service) telephone line in his home. Thus, the user uses an analog modem, such a V.34 modem, or an ISDN terminal adapter, to connect through the POTS telephone line to the remote data site. However, when the telephone line is used for this purpose, and the user is connected through the POTS telephone line to the remote 30 data site, the user is unable to receive telephone calls from other parties, since the telephone line is in use.

Many home users who connect to the Internet or to other remote data sites typically purchase a second phone line from the telephone company to enable the user to receive telephone calls while the user is connected to the remote data site. Thus, the user purchases a

second telephone line and uses this telephone line to connect to an Internet service provider or other remote data site. This use of the second telephone line for data connectivity leaves the primary telephone line available for incoming phone calls. However, a second telephone line is somewhat expensive. For example, for a home user connecting to the Internet, the 5 cost of the second telephone line is generally similar to the connection cost of the Internet service provider. Thus, the requirement of the second telephone line essentially doubles the Internet service fee the user is required to pay to obtain the Internet connection while maintaining the ability to receive incoming calls. In addition, when a user connects to another remote data site, such as a corporate office, the purchase of a second telephone line 10 is an undesirable cost.

Therefore, a new system method is desired which enables the user to connect to the remote data on a communications line, wherein the user maintains the ability to receive telephone calls from other parties through the communications line while the user is connected to the remote data site on the communications line.

15

Summary of the Invention

The present invention comprises a system and method for enabling a remote user to connect to a remote data site on a communication line, such as a telephone line, wherein the 20 remote user is still able to receive telephone calls from other parties on the telephone line. The present invention thus allows a remote user to connect to a remote data site, such as a corporate office or Internet Service Provider, on a single telephone line, while also maintaining the ability to receive telephone calls on this single telephone line. This obviates the necessity of the user having to purchase a second telephone line for incoming calls while 25 data communications are being performed, thus reducing access costs.

In the system of the preferred embodiment, the remote user includes a modem or user 30 telephony communication device configured to connect to a remote data site through the public switched telephone network (PSTN). The remote user may be a home user desiring to connect through an Internet service provider to the Internet, or a telecommuter working at home desiring to connect to a local area network (LAN) at a corporate office or another data site. The remote user includes a computer system or other data access device. The user

telephony communications device is configured to connect to a communication line, such as a telephone line. The communication line or telephone line has a first telephone number, i.e., the communication line or telephone line has been assigned a first telephone number by the telephone company central office.

5 The remote data site includes one or more communication servers. The communication servers perform intelligent call routing functions according to the present invention, as discussed below. The communication servers are configured to connect to the PSTN. Thus when the user telephony communication device connects through the PSTN to the remote data site, the user telephony communication device connects to one of the one or
10 more communication servers. The one or more communication servers connect to one or more data servers or data storage devices. For example, where the remote data site is an Internet service provider, the one or more communication servers connect to the Internet.

15 In one embodiment, when the user telephony communications device connects to the remote data site on a communication line, the communication server at the remote data site operates to assign a second telephone number. The second assigned telephone number may also be pre-assigned by the remote data site. The communication server at the remote data site then performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. After the user telephony communications device connects to the remote data site on the communications
20 line, the user telephony communications device performs data transfers, such as web browsing or file transfers, with the remote data site using the communication line.

25 While the user is performing data communications on the communication line with the remote data site, if another party places a telephone call to the remote user using the first telephone number, i.e., the first telephone number assigned to the communications line being used by user telephony communications device, the call forwarding operation causes the telephone company central office to forward or route the telephone call made to the first telephone number to the second telephone number, i.e., causes the telephone call to be forwarded or routed to the second telephone number. As noted above, this second telephone number is maintained by the remote data site. Thus, when another party places a telephone
30 call to the first telephone number during data access operations, the remote data site receives the telephone call to the assigned second telephone number.

When the communication server at the remote data site receives a telephone call to an assigned second telephone number, i.e., a call that has been forwarded or routed to an assigned second telephone number, the communication server determines which user corresponds to the received call and if the user telephony communications device which has this assigned second telephone number is currently connected to the remote data site. The communication server then routes the received telephone call to the user telephony communications device using the communication line that is currently being used for data transfers between the user telephony communications device and the remote data site. The received telephone call can be routed in a number of ways, including through the user of DSVD (digital simultaneous voice and data) modems, and including the voice data in IP traffic transferred to the user telephony communications device, among others.

Thus, the remote user can still perform data communications with the remote data site while allowing telephones at the remote user's location to be able to receive telephone calls that were made to the first telephone number, all on a single communications line. This obviates the necessity of the remote user having to purchase a second phone line, since the user can perform data communications with the remote data site while still being able to receive telephone calls.

In another embodiment, the user telephony communications device first performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. The second assigned telephone number is pre-assigned by the remote data site. The user telephony communications device then connects to the remote data site on a communication line. After the user telephony communications device connects to the remote data site on the communications line, the user telephony communications device performs data transfers, such as web browsing or file transfers, with the remote data site using the communication line.

In an alternate embodiment, the user telephony communications device connects to the remote data site on a communication line, and the communication server at the remote data site dynamically assigns a second telephone number to the user. The remote data site transmits this dynamically assigned second telephone number to the user telephony communications device. Thus, in this embodiment, the second telephone number is dynamically assigned on each connection. The user telephony communications device then

disconnects from the remote data site and performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. Once the user telephony communications device has performed this call forwarding operating, the user telephony communications device reconnects to the 5 remote data site on the communication line, and then begins performing data transfers.

In one embodiment of the invention, a telephone call provided by the communication server on the communication line to the user telephony communication device operates to ring all other telephone extensions connected to that telephone line. For example, for a home 10 user connected to the Internet, when a telephone call is received from the communication server at the remote data site, the telephone call not only rings at the user telephony communication device, but also rings at all of the other extensions in the house which are connected to the telephone line. In this embodiment, the location where the user is located includes logic which causes the other extensions to ring when a telephone call is received from the communication server at the remote data site.

15 The present invention thus comprises a system and method for enabling a subscriber to receive incoming telephone calls on a telephone line and ring all extensions associated with the telephone line. The telephones may be rung even when the subscriber is performing data communications with a remote data site on the telephone line. Also, due to the data communications being performed, the incoming call information is received in a data packet, 20 not as a traditional ring signal from the telephone company central office. The present invention is operable to receive the call information in the data packet and ring other extensions. This obviates the necessity of the subscriber having to purchase a second telephone line for incoming calls while data communications are being performed, thus reducing access costs.

25 The system comprises a telephone line for transferring telephone signals between a telephone network and a premises, and the system comprises first and second conductor pairs comprised within the premises for transferring telephone signals within the premises. The system further comprises a wiring device coupled between the telephone line and the conductor pairs, wherein the wiring device connects the telephone line to the second conductor pair. One or more telephone instruments are coupled to the first conductor pair, 30 i.e., the normal wiring typically found in premises today. The system further comprises a

communication device or modem coupled to both the first and second conductor pairs and coupled to the telephone line through the second conductor pair and wiring device.

The invention is operable to ring all of the telephones connected to the first conductor pair inside the subscriber's premises. The first conductor pair would have normally been connected to the external telephone line. The system and method advantageously employs the wiring device to reroute the telephone line to the second conductor pair in the home instead of the first conductor pair to which the phones are connected. The second conductor pair is normally not used within a house with a single purchased telephone line, and is normally used to connect to a second purchased telephone line. The system and method further employs a modem which receives signals indicating an incoming telephone call from the telephone line via the second conductor pair and causes ring signals to be generated to the telephones connected to the first conductor pair in response to the signals indicating an incoming call. Preferably, the signals indicating an incoming call comprise one or more data packets.

The modem includes a Central Office (CO) simulator circuit, which includes a ring generator, coupled to the first conductor pair which regenerates the telephone signals, such as a ringing voltage, to the telephones connected to the first conductor pair. In other words, the modem includes a ring generator coupled to the first conductor pair for ringing the telephones which are coupled to the first conductor pair. The modem further comprises a line interface circuit coupled to the second conductor pair. The line interface circuit comprises a switch coupled between the conductors of the second conductor pair and the modem. The switch closes, i.e., goes off hook, in order to complete a circuit with a CO at the far end of the telephone line. The switch closes to enable the modem to answer or place a call on the telephone line.

The modem further comprises communications circuitry, such as a data pump and a codec, for performing data communications with the telephone network on the telephone line. Preferably, the modem is coupled to a computer, wherein the modem is operable to perform data communications between the computer and the telephone network. The modem further comprises a controller, such as a microcontroller or a task of the attached computer, operably coupled to the line interface and the communication circuitry. The controller is operable to control the ring generator to ring the one or more telephone instruments in

response to signals indicating an incoming call received from the second conductor pair transferred on the telephone line which indicate an incoming call. The control circuitry is operable to control the ring generator to ring the one or more telephone instruments in response to the signals indicating an incoming call received from the second conductor pair 5 through the telephone line while the modem is performing data communications with the telephone network. During data communications, the remote data site may transmit a data packet or signals which indicates an incoming call.

The modem is also operable to perform voice communications between the one or 10 more telephone instruments and the telephone network on the telephone line while simultaneously performing the data communications with the telephone network.

The system further comprises a relay for selectively coupling the first conductor pair to either the second conductor pair or to the ring generator. The relay couples the first conductor pair to the second conductor pair when the switch is open, i.e., on hook, thereby enabling normal voice communications using the telephones as if the wiring device and 15 modem were not present. The relay couples the first conductor pair to the ring generator when the switch is closed. Thereby, the modem is enabled to perform simultaneous voice and data communications on the telephone line, and the ring generator is thereby enabled to ring the telephones via the first conductor pair.

In one embodiment, the relay is comprised within the modem. In another 20 embodiment, the relay is comprised within a second wiring device coupled between the modem and the first and second conductor pairs. In the second wiring device embodiment, the ringing circuit may be comprised within the second wiring device rather than within the modem, or the second wiring device may comprise a ring booster circuit to assist in ringing the telephones. If the ringing circuit is comprised within the second wiring device, the 25 computer provides a notification to the computer user that a call is incoming, since there is no ringing circuit in the modem to ring a telephone coupled directly to the modem. Preferably, the computer displays an indication on its display screen of the incoming call and/or beeps or synthesizes the sound of a ringing phone. This embodiment is particularly 30 advantageous for power constrained or space constrained applications such as notebook computers. In an alternate embodiment, the computer receives the data packet, such as an IP

packet, indicating the incoming phone call and controls the ring generator to ring the telephones in response to the packet, rather than the modem controlling the ring generator.

Brief Description of the Drawings

5

A better understanding of the present invention can be obtained when the following detailed description of the preferred embodiment is considered in conjunction with the following drawings, in which:

Figure 1 illustrates a system wherein a user connects to a remote data site on a communication line, such as a telephone line, while maintaining telephone connectivity on the communication line according to the present invention;

Figure 1A illustrates an embodiment of the invention where the remote data site is an Internet service provider;

Figure 2 illustrates the communication servers of Figures 1 and 1A;

Figures 3A and 3B are flowchart diagrams illustrating the user telephony communications device connecting to a remote data site on a communication line and performing operations to maintain telephone connectivity on the communication line according to the present invention;

Figure 3C is a flowchart diagram illustrating operations when the user telephony communications device disconnects from the remote data site;

Figure 4 illustrates one embodiment of the user telephony communications device receiving an assigned second telephone number;

Figure 5 is a flowchart diagram illustrating operations performed by the user telephony communications device according to the embodiment of Figures 3A and 3B;

Figures 6A and 6B are flowchart diagrams illustrating an alternate embodiment where the remote data site dynamically assigns telephone numbers to the user telephony communications device, and the user telephony communications device temporarily disconnects from the remote data site to perform the call forwarding operation;

Figure 6C is a flowchart diagram illustrating operation of the remote data site receiving a telephone call and routing the call to the user telephony communications device;

Figures 7A and 7B are flowchart diagrams illustrating operations performed by the user telephony communications device according to the embodiment of Figures 6A through 6C; and

5 Figures 8A and 8B are flowchart diagrams illustrating an alternate embodiment where the remote data site performs the call forwarding operation;

Figure 9 is a block diagram of a telecommunications system including a modem 104 of Figure 1 which does not embody the extension ring capabilities of the present invention, but which serves to illustrate advantages of the present invention;

10 Figure 10 illustrates a home which couples to a standard POTS telephone line; and

Figure 11 is a block diagram of a telecommunications system according to one embodiment of the present invention;

Figure 12 illustrates the wiring device of Figure 11 configured according to one embodiment of the present invention;

Figure 13 illustrates in more detail the relay of Figure 11; and

15 Figure 14 is a block diagram of a telecommunications system according to an alternate embodiment of the present invention.

Detailed Description of the Specific Embodiments

20 Figure 1 - System of the Present Invention

Figure 1 illustrates a system which provides a user operating a user telephony communications device with connectivity to a remote data site over a communication line or telephone line. In the system of Figure 1, the user maintains telephone connectivity with other parties through this communication line or telephone line while the user is connected to the remote data site on the communication line. In other words, the user can receive telephone calls made to the telephone number assigned to the communication line or telephone line while the user telephony communications device 104 is connected to the remote data site over the communication line or telephone line. The user can also place outgoing telephone calls on the communication line or telephone line while the user

telephony communications device 104 is connected to the remote data site over the communication line or telephone line.

As shown, the system of Figure 1 illustrates a remote user including a user telephony communication device 104 configured to connect to a remote data site through the public switched telephone network (PSTN). The remote user may be a home user, i.e., a user operating at his home. For example, the user may be a person at home desiring to connect through an Internet service provider to the Internet. The user may also be a telecommuter working at home desiring to connect to a local area network (LAN) at a corporate office or another data site. In general, the user is a person who desires to connect to a remote data site through a communication line or telephone line and who desires to be able to receive calls on that communication line or telephone line without having to purchase a second phone line from the telephone company.

The remote data site correspondingly may be an Internet service provider, a corporate LAN, a telephone company central office, or any other location where data is stored or through which data may be accessed.

As shown, the remote user will generally operate a computer system 102. The computer system 102 may be any type of data access device, including a general purpose computer, a personal digital assistant (PDA), a network computer, or television or other viewing device configured as an Internet access device or information access device.

The computer system 102 connects through a user telephony communication device 104 to the public switched telephone network. In the embodiment of Figure 1, the user telephony communication device 104 comprises a modem 104 which connects to the PSTN. In one embodiment, the modem 104 is a standard modem. Alternatively, the modem 104 supports both voice and data capabilities. For example, in one embodiment the modem 104 is a digital simultaneous voice and data (DSVD) modem. However, in other embodiments, the user telephony communication device 104 comprises an ISDN terminal adapter, ATM card, or other user telephony communications device 104 for connecting to the PSTN. The user telephony communication device 104 may be external to the computer system 102, or may be comprised in the computer system 102.

As discussed further below, in some embodiments the user telephony communication device 104 is configured to perform intelligent call forwarding operations to enable the user

to be able to receive telephone calls on a telephone line 108 while performing data access operations using the telephone line 108. In other embodiments, the modem 104 is a standard modem, and a communication server at the remote data site operates to perform the call forwarding operations.

5 The remote user location also includes a telephone 106, which provides standard POTS for ISDN service. As shown, the telephone 106 also connects to the PSTN, preferably through the PSTN. The telephone 106 may connect directly to the PSTN or may connect through the user telephony communication device 104 to the PSTN. The user telephony communication device 104 may also be comprised in the telephone 106.

10 In the preferred embodiment, the user telephony communication device 104 comprises communication logic for sending / receiving voice and/or data. The user telephony communications device 104 can also be broadly defined as comprising one or more of the communication device 104, the telephone 106, and/or the computer system 102 configured to operate as a telephony communications device.

15 The user telephony communication device 104 connects to the PSTN through a communications line or communications media 108. In the preferred embodiment, the communications line 108 is a standard POTS telephone line, such as category 3 two wire twisted pair wiring. The communication line 108 may be a POTS telephone line or an ISDN line, or other type of communication line. The communications line 108 may comprise any 20 of various other types of media, such as ordinary twisted pair telephone wiring, coaxial cable, fiber optic cable or other types of transmission media.

25 The communication line or telephone line 108 has an associated first telephone number, i.e., the communication line or telephone line 108 has been assigned a first telephone number by the telephone company central office. Thus, when other parties desire to call the user of the user telephony communications device 104, the other parties dial this first number. As is well known in the art, when other parties dial this first number during normal operation, this causes ring signals to be generated on the communication line or telephone line 108. This causes all telephony devices connected to the communication line 108 or telephone line 108 to "ring" or otherwise indicate that a call is occurring.

30 The remote user connects through the user telephony communication device or modem 104, through the PSTN to a remote data site. The remote data site includes one or

more communication servers 122, also referred to as remote data site servers 122. The one or more communication servers 122 perform intelligent call routing functions according to the present invention, as discussed below. The one or more communication servers 122 are configured to connect to the PSTN. Thus when the user telephony communication device 104 connects through the PSTN to the remote data site, the user telephony communication device 104 connects to one of the one or more communication servers 122 at the remote data site. The one or more communication servers 122 are preferably coupled together by a data bus and an audio bus. The audio bus is configured to carry speech and/or voice data.

The one or more communication servers 122 connect to one or more data servers or data storage devices 124. For example, where the remote data site is an Internet service provider, the one or more communication servers 122 connect to the Internet. Thus, when the user connects to the Internet, the user telephony communication device 104 connects through the PSTN and through the one or more communication servers 122 to the Internet. If the remote data site is a corporate LAN, the one or more communication servers 122 connect to the corporate LAN, i.e., connect to one or more data servers or file servers on the corporate LAN.

The system and method of the present invention allows the remote user to connect through a single telephone line 108 through the PSTN to a remote data site, while enabling the user to be able to receive telephone calls from external parties on this same telephone line 108. This obviates the necessity for the remote user having to purchase a second phone line to receive telephone calls while the user is performing remote data access services, such as Internet access or access to the corporate LAN.

Figure 1A - Internet Service Provider Embodiment

25.

Referring now to Figure 1A, an embodiment of the invention is shown wherein the remote data site is an Internet service provider premises which provides connectivity to the Internet. As shown, the Internet service subscribers home includes a computer 102 and user telephony communication device 104. The user telephony communication device 104 connects to the public switched telephone network (PSTN). The Internet service provider premises connects to the PSTN through one or more inbound dial-up data lines as shown.

The Internet service provider premises also connects to the PSTN through a plurality of direct inward dial (DID) voice lines.

As shown in Figure 1A, the Internet service providers premises includes one or more communications servers 122. Figure 1A illustrates the ISP premises as having three 5 communications servers 122 as shown. The communication servers 122 are connected by an audio bus 132 and a data bus 134. The data bus 134 provides connectivity between each of the communications servers 122. The audio bus 132 conducts telephony voice data between the communication servers 122.

When the user desires to connect to the Internet provider, the user telephony 10 communication device 104 connects through the PSTN and through one of the inbound dial-up data lines to the ISP premises. A call forwarding operation is performed, preferably by either the user telephony communication device 104 or a communication service 122 at the ISP premises. The call forwarding operation is performed prior to or during the connection in order to call forward telephone calls that would normally be received at the user's or 15 subscriber's home, wherein the call forwarding operation routes or forwards these calls to the Internet service provider's premises. The call forwarding operation operates to forward calls that would normally be received at the Internet service subscriber's home to one of the direct inward dial (DID) voice lines which are received at the ISP premises.

The call-forwarding operation is performed prior to or during the data connection in 20 order to call-forward telephone calls that would normally be received at the user's or subscriber's home, wherein the call forwarding operation routes or forwards these calls to the remote data site. The call forwarding operation preferably operates to forward calls that would normally be received at the subscriber's home to one of a plurality of direct inward dial (DID) voice lines which are received at the remote data site from the PSTN. The call 25 forwarding operation may comprise a standard call forwarding operation, such as using "72#", or the operation may comprise use of other telephony features such as call diversion to another number in the case of a busy line.

When the ISP premises receives a voice telephone call on one of the DID lines, which 30 has been forwarded from a respective user's home telephone number, the communications service 122 at the ISP premises operates to route this call through a respective inbound dial-up data line, which the user is currently using, through the PSTN, through the user's single

telephone line, to the user telephony communication device 104 of the user to which the call is intended. Thus, the Internet service subscriber can receive voice telephone calls on the single telephone line while also performing data communications using this single telephone line.

5 In one embodiment, the voice traffic is included or multiplexed into the IP traffic being provided to the user. In another embodiment, the voice traffic is transferred to the user telephony communication device using DSVD modems.

Figure 2 - Communication Server Block Diagram of the Preferred Embodiment

10

Figure 2 is a block diagram of one of the one or more communication servers 122 according to the preferred embodiment of the invention. Figure 2 illustrates two communication servers 122. As shown, the two communications servers 122 are connected by a local area network (LAN) data bus 134 and an audio bus 132, as shown.

15

As shown, each communications server 122 includes a multi-line adapter for connecting to a multi-line carrier service of the PSTN. Examples of a multi-line carrier service of the PSTN include T1 lines, ISDN primary rate interface (PRI), asymmetric digital subscriber line (ADSL), and other digital subscriber line technologies. Examples of multi-line adapters includes T1 lines, ISDN-PRI adapters, and digital subscriber line adapters, 20 among others. Each communication server 122 also includes multi-modem adapters, as shown. Each communication server 122 further includes an optional analog line interface which provides standard POTS (plain old telephone service) telephone connectivity.

20

As shown, each communications server 122 includes a network interface card for connecting to the data bus 134. As shown, the data bus 134 may comprise a local area network. The local area network (LAN) may comprise an Ethernet network or Token Ring network or many other types of network protocols.

25

Each communication server 122 further includes inter-chassis audio bus interface logic for coupling to the audio bus 132. Examples of the audio bus interface include the MVIP architecture or the SCSA (signal computing system architecture). The audio bus 132 is used for transferring voice data between the respective communication servers 132. The 30 audio bus 132 is necessary because a user may be connected through the PSTN to a first

communication server 122, and a telephone call may be forwarded to a second assigned telephone number at a different communication server 122. When this occurs, the server 122 which receives the call to the second assigned telephone number is required to route the voice signals to the communication server 122 to which the user currently has a data connection, so 5 that the voice signals may be routed through the user's data connection through the PSTN to the user telephony communication device 104.

Each of the communications servers 122 includes a memory for storing second number assignment information. In the preferred embodiment, the remote data site statically pre-assigns a second telephone number to each user telephony communication device 104. 10 Thus in this embodiment, a user telephony communications device 104 has been assigned a second telephone number, preferably a direct inward dialing (DID) number. This second telephone number is preferably assigned by the communication server 122 at the remote data site. In this embodiment, the second telephone number is pre-assigned, i.e., is already assigned prior to the telephony communications device 104 connecting to the remote data 15 site. In this embodiment, the second telephone number is also statically assigned, i.e., the same second telephone number is used by a respective remote user during each connection to the remote data site.

When the user later desires to connect to the remote data site, the respective user telephony communication device 104 performs a call forwarding operation to the assigned 20 second telephone number before connecting to the remote data site. Alternatively, the user telephony communication device 104 first connects to the remote data site, and the communication server 122 at the remote data site operates to perform the call forwarding operation. As noted above, the call forwarding operation may comprise a standard call 25 forwarding operation, such as using "72#", or the operation may comprise use of other telephony features such as call diversion to another number in the case of a busy line.

The memory 210 stores a data structure or table comprising each user, or user telephony communication device 104, and the corresponding assigned second telephone number. When a call is forwarded to one of the pre-assigned second telephone numbers, the respective communication server 122 uses the second telephone number to determine the 30 appropriate user to which the call should be routed.

Each communication server 122 includes logic for providing both data and voice communications on a single communication line 108. Thus when one of the communication servers 122 receives a call to an assigned second telephone number, and it is necessary to route the call to the corresponding user telephony communication device 104, the logic 5 operates to include the analog voice data into the data stream, which is provided to the user. As noted above, in one embodiment the communication server 122 includes the voice traffic into the IP packets which are being transmitted to the user telephony communication device 104. Alternatively, each of the communication server 122 and the user telephony communication device 104 include DSVD modems for performing the simultaneous voice 10 and data operations.

Figures 3A - 3C: Flowchart Diagrams of the Preferred Embodiment

Referring now to Figures 3A - 3C, a flowchart diagram illustrating operation of the 15 preferred embodiment of the present invention is shown. Figures 3A - 3C illustrate an embodiment whereby the user, or the user telephony communication device 104, is assigned a telephone number and performs a call forwarding operation to this telephone number before connecting to the remote data site. The call forwarding operation enables the user 20 telephony communication device 104 to maintain telephone connectivity on the communication line 108 for incoming calls while data communications are being performed.

As discussed above, here it is assumed that the user telephony communications device 104 is configured to connect to a communication line, such as a telephone line. The communication line or telephone line has a first telephone number, i.e., the communication line or telephone line has been assigned a first telephone number by the telephone company 25 central office. Thus, when other parties desire to call the user of the user telephony communications device 104, the other parties dial this first number. As is well known in the art, when other parties dial this first number during normal operation, this causes ring signals to be generated on the communication line or telephone line 108. This causes all telephony devices connected to the communication line or telephone line 108 to "ring" or otherwise 30 indicate that a call is occurring.

For example, if the user is a home user operating at home, the user telephony communications device 104 is the user's modem or other communications device, or a computer system configured to perform a telephony modem function. Also, in the instance of a home user, the first telephone number is the telephone number assigned to the respective home user, i.e., the telephone number a party dials to call the home user.

5 In this embodiment, it is presumed that the user telephony communications device 104 has been assigned a second telephone number, preferably a direct inward dialing (DID) number. This second telephone number is preferably assigned by the remote data site.

In this manner, the remote data site can assign DID numbers to each user and actually 10 maintain a much lesser number of physical lines, i.e., a number of physical lines which is far less than the number of possible subscribers to the remote data site. This is possible since it is presumed that not every subscriber will desire to connect to the remote data site at exactly the same time. This also differs from the conventional situation where a home user is required to purchase a second telephone number and pay for this second telephone number 15 twenty-four hours a day, regardless of how often this second telephone number is used. According to this embodiment, the remote data site allocates DID numbers to each user or subscriber, and maintains a plurality of physical telephone lines which is a fraction of the number of users. Since not every user will desire to connect to the remote data site at the exact same time, the remote data site can pay for and maintain a much smaller number of 20 physical telephone numbers which are only used when users connect to the remote data site. This results in considerable cost savings to each of the remote users who are no longer required to purchase a second telephone number, and in essence only required to pay for the time period that a physical telephone line is allocated when the user is connected to the remote data site.

25 In this embodiment, the second telephone number is pre-assigned, i.e., is already assigned prior to the telephony communications device connecting to the remote data site. In this embodiment, the second telephone number is also statically assigned, i.e., the same second telephone number is used by a respective remote user during each connection to the remote data site. The manner in which the second telephone number is assigned is discussed 30 further below. As discussed above, each communication server 122 at the remote data site maintains a data structure in memory which stores the assigned second telephone numbers

and their corresponding users. In an alternate embodiment, discussed below, the second telephone number is dynamically assigned on each connection.

Figure 3A - User Connects to Remote Data Site

5

As shown, in step 306 the user telephony communications device 104 performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. In other words, in step 308 the telephony communication device performs a call forwarding operation which directs that 10 telephone calls made to the first telephone number and assigned to the remote user should instead be routed to the second telephone number which is being maintained at the remote data site. As noted above, the call forwarding operation may comprise a standard call forwarding operation, such as using "72#", or the operation may comprise use of other telephony features such as call diversion to another number in the case of a busy line.

15

In step 308 the user telephony communications device 104 connects to the remote data site on a communication line 108. Thus, in step 308 the user telephony communications device 104 makes a telephone call on the communication line 108 to the remote data site. This involves the communications device 104 dialing the telephone number of the remote data site to establish a telephone connection. As discussed above, the communication line 20 108 may be a POTS telephone line or an ISDN line, or other type of communication line. The communications line 108 may comprise ordinary telephone wiring, such as two wire twisted pair wiring, coaxial cable, fiber optic cable or other types of transmission media, or a combination thereof.

25

After the user telephony communications device 104 connects to the remote data site on the communications line 108, in step 312 the user telephony communications device 104 performs data transfers with the remote data site using the communication line 108. For example, if the remote user is a home user who desires to perform Internet access, and the remote data site is an Internet access provider that provides access to the Internet, the user telephony communications device 104 performs various web browsing or other Internet access functions in response to user input. If the remote user is a telecommuter operating at 30 home and desiring to connect to the corporate LAN, then the user telephony communications

device 104 performs various file access or other data access or communications functions with the local area network of the corporate office in response to user input.

Figure 3B - Communication Server Receives Call to Assigned Second Telephone Number

5

While the user is performing data communications on the communication line 108 with the remote data site, if another party places a telephone call to the remote user using the first telephone number, i.e., the first telephone number assigned to the communications line 108 being used by user telephony communications device, the call forwarding operation 10 performed in step 306 causes the telephone company central office to forward or route the telephone call made to the first telephone number to the second telephone number, i.e., causes the telephone call to be forwarded or routed to the second telephone number. As noted above, this second telephone number is maintained by the remote data site. Thus, when another party places a telephone call to the first telephone number during the 15 operations of step 312, the remote data site receives a telephone call to the assigned second telephone number in step 314. This telephone call which is forwarded or routed to the assigned second telephone number is received by the communication server 122 located at the remote data site.

When the communication server 122 at the remote data site receives a telephone call 20 to an assigned second telephone number in step 313, i.e., a call that has been forwarded or routed to an assigned second telephone number, the communication server 122 examines the data structure in memory in step 314 to determine which user corresponds to the received call. After determining the appropriate user in step 314, in step 316 the server 122 at the remote data site determines if the user telephony communications device 104 which has this 25 assigned second telephone number is currently connected to the remote data site.

If the user telephony communications device 104 which has the assigned telephone number is determined to be connected to the remote data site in step 316 when the telephone call to the assigned second telephone number is received, then in step 320 the communication server 122 routes the received telephone call to the user telephony communications device 30 104 using the communication line that is currently being used for data transfers between the user telephony communications device 104 and the remote data site. For example, if the user

telephony communications device 104 is connected through the public switch telephone network (PSTN) to the communication server 122 at the remote data site on a standard POTS or ISDN telephone line, the remote data site operates to route the telephone call which has been forwarded to the assigned second telephone number on to this POTS or ISDN telephone line through the PSTN to the user telephony communications device.

As discussed above, the user telephony communications device 104 includes simultaneous voice and data capabilities. In other words, the user telephony communications device 104 is capable of receiving both voice and data communications on the same communications line at substantially the same time. Thus, the communication server 122 at the remote data site operates to multiplex the telephony voice data onto the communication line that is currently being used for data communications between the user telephony communications device 104 and the communication server 122 at the remote data site. Thus, the remote user can still perform data communications with the remote data site while allowing telephones at the remote user's location to able to receive telephone calls that were made to the first telephone number, all on a single communications line. This obviates the necessity of the remote user having to purchase a second phone line, since the user can perform data communications with the remote data site while still being able to receive telephone calls.

In one embodiment of the invention, a telephone call provided by the communication server 122 on the communication line to the user telephony communication device operates to ring all other telephone extensions connected to that telephone line. For example, for a home user connected to the Internet, when a telephone call is received from the communication server 122 at the remote data site, the telephone call not only rings at the user telephony communication device, but also rings at all of the other extensions in the house which are connected to the telephone line. In this embodiment, the location where the user is located includes logic which causes the other extensions to ring when a telephone call is received from the communication server 122 at the remote data site. This embodiment is discussed further below.

If the user telephony communications device 104 is determined to not be connected to the remote data site in step 316 when the call to the assigned second telephone number is received in step 314, then in the preferred embodiment the communication server 122 plays a

recorded voice message asking the calling party to please try the number again. In this embodiment the user telephony communications device 104 is configured to disable the call forwarding operation made in step 306 after the user telephony communications device disconnects from the remote data site. When this occurs telephone calls that are originally 5 made to the first telephone number are received by the remote user without any call forwarding operations being performed.

Thus, there is a small window of time after the user telephony communications device 104 disconnects from the remote data site and before the user telephony communications device 104 disables the call forwarding operation. During this period of time, a party which 10 dials the first telephone number in an attempt to call the user will still be forwarded to the communication server 122 at the remote data site, even though the user has already disconnected from the remote data site. It is noted that a call to the first telephone number which is forwarded to the assigned second telephone number after the user has disconnected should rarely occur, since this time window is relatively short. Where this does occur, the 15 voice message informs the calling party to try the call again. When the calling party tries the call again, the call forwarding will presumably have been discontinued by the time the calling party tries again. Thus this voice message will be played at most once for a calling party.

Another possibility for the user telephony communications device 104 being 20 determined to not be connected to the remote data site in step 316 when the call to the assigned second telephone number is received in step 314 is that the user telephony communications device 104 has malfunctioned and is thus unable to discontinue the call forwarding operation. Thus, in one embodiment, if several calls are received for the assigned second telephone number after the has disconnected from the remote data site, the 25 communication server 122 at the remote data site operates to perform a remote access call forwarding (RACF) operation to cancel the initial call forwarding made by the user telephony communications device 104 in step 306. This disables calls made to the first telephone number from being forwarded to the assigned second telephone number. This is performed to ensure that the user still receives telephone calls even when the user telephony 30 communications device malfunctions and is thus unable to disable the call forwarding operation performed in step 306.

Figure 3C - User Disconnects from the Remote Data Site

Referring now to Figure 3C, a flowchart diagram is shown which illustrates operation of the user telephony communications device when data communications are terminated with the remote data site. As shown, in step 332 the user telephony communications device discontinues data communications with the remote data site in response to user input. In step 334 the user telephony communications device disconnects from the remote data site, i.e. disconnects from the communication server 122 at the remote data site, in response to the user desiring to discontinue data operations with the remote site. In step 336, the user telephony communications device performs an operation to the telephone company central office which operates to discontinue the call forwarding operation performed in step 306 of Figure 3A. This operates to discontinue the call forwarding of the first telephone number to the assigned second telephone number. This is necessary since the user telephony communications device is no longer connected to the remote data site, and thus the communication server 122 at the remote data site is no longer able to route calls that are forwarded to the assigned second telephone number. The user telephony communications device performs this operation to discontinue the call forwarding in step 336 in response to the user telephony communications device disconnecting from the remote data site in step 334.

The user telephony communications device preferably discontinues the call forwarding operations in step 336 after the user telephony communications device discontinues data communications to the remote data site. This is necessary, since the user telephony communications device is required to have a dial tone from the telephone company central office in order to cancel the call forwarding operation.

In an embodiment where a dial tone is not required to cancel the call forwarding operation, the user telephony communications device may discontinue the call forwarding operation in step 336 just prior to the user telephony communications device disconnecting from the remote data site in step 334. In this embodiment, the user telephony communications device discontinues call forwarding in step 336 prior to disconnecting in 334 in order to ensure that no calls are inadvertently forwarded to the assigned second

telephone number at the remote data site after the disconnection is performed. Thus, a party attempting to call the remote user using the first telephone number may receive a busy signal during the short period that the user telephony communications device is still connected but the call forwarding operation has been discontinued. Thus it may be more desirable for 5 other parties to hear a busy signal for a very short time window than for calls to be inadvertently forwarded to a second telephone number at the remote data site after the user has disconnected for this short time window.

Figure 4 - User Subscribes to the Remote Data Site

10

Referring now to Figure 4, a flowchart diagram which illustrates operation of a user telephony communication device receiving an assigned second telephone number is shown. Figure 4 illustrates four steps labeled 342 - 348. It is noted that steps 342 - 346 are optional steps, and one or more of steps 342 - 346 may be omitted, as desired.

15 In step 348 the user telephony communication device receives an assigned second telephone number. This number is stored by the user telephony communication device, and is used each time the user telephony communication device connects to the remote data site. The user telephony communication device may receive the assigned second telephone number in various ways. In one embodiment, the remote data site provides software to the 20 user, and the user configures the user telephony communication device using the software. This configuring includes the user telephony communications device receiving and storing the assigned second telephone number. For example, where the remote data site is an Internet service provider, the remote data site provides software, such as one or more floppy disks, to the user, which the user then uses to store one or more software applications on the 25 user's computer and/or configure the user telephony communication device with the assigned second telephone number.

Referring again to Figure 4, steps 342 - 348 are now discussed. These steps illustrate 30 operation of a user subscribing to a remote data site and receiving an assigned second telephone number. As shown, in step 342 the user telephony communication device provides subscription information to the remote data site to enable usage of the remote data site. In step 344 the remote data site receives the subscription information. The subscription

information enables the user to begin an account with the remote data site, i.e., allows the user to begin using the remote data site.

For example, if the user is a home user who desires Internet access, and the remote data site is an Internet service provider, the user provides information to the Internet service provider to begin an account with the Internet service provider. In step 342 the user 5 telephony communication device provides the subscription information to the remote data site. However, it is noted that the subscription information may be provided by any of various means. In other words, the user may set up an account to begin using the remote data site using any of various means. If the user is a home user or telecommuter who desires 10 access to the corporate LAN, the user preferably obtains the necessary information to begin using the corporate LAN from the corporation's information services (IS) manager, or through other means.

Step 346 illustrates the remote data site transmitting the assigned second telephone number to the user telephony communication device in response to the remote data site 15 receiving the subscription information. As noted above, the user telephony communication device may receive the assigned second telephone number through any of various means. Step 346 illustrates one embodiment where the remote data site transmits the assigned second telephone number to the user telephony communication device on the communication line or telephone line.

20 In step 348 the user telephony communication device receives the assigned second telephone number. As discussed above, the assigned second telephone number may be received through any of various means, such as through transmission from the remote data site, or through user configuration. The assigned second telephone number may be received in response to the remote data site receiving the subscription information in step 344.

25

Figure 5 - Preferred Embodiment Steps Performed by User Telephony Communications Device

Referring now to Figure 5, a flowchart diagram is shown illustrating steps performed by the user telephony communication device in the preferred embodiment of the present invention. Figure 5 illustrates steps performed by the user telephony communication device in the preferred embodiment shown in Figures 3A and 3B. As discussed above, in this embodiment the user telephony communication device is assigned a telephone number, referred to as the second telephone number, and performs a call forwarding operation to this telephone number before connecting to the remote data site. The call forwarding operation enables the user telephony communication device to maintain telephone connectivity on the communication line while data communications are being performed on this communication line. In other words, the user can receive telephone calls on the same telephone line that is being used for data connectivity.

In this embodiment, it is presumed that the user telephony communications device has been assigned a second telephone number, preferably a direct inward dialing (DID) number. This second telephone number is preferably assigned by the remote data site. In this embodiment, the second telephone number is pre-assigned, i.e., is already assigned prior to the user telephony communications device connecting to the remote data site. As shown, in step 304 the user telephony communications device receives and stores this assigned second telephone number. In one embodiment, as mentioned above, the user receives software from the remote data site which configures the second telephone number on the user telephony communications device. The communication server 122 may also transmit the second telephone number directly to the user telephony communications device on the communication line. As noted above, the assigned second telephone number is received and stored in the user telephony communications device only once, and this number is used each time for connection to the remote data site.

In step 306 the user telephony communications device performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. In other words, in step 306 the user telephony communication device performs a call forwarding operation which directs that telephone

calls made to the first telephone number and assigned to the remote user should instead be routed to the second telephone number which is being maintained at the remote data site. As noted above, the call forwarding operation may comprise a standard call forwarding operation, such as using "72#", or the operation may comprise use of other telephony 5 features such as call diversion to another number in the case of a busy line.

In step 308 the user telephony communications device connects to the remote data site on a communication line. Thus, in step 308 the user telephony communications device, which includes the modem 104 or other communications device, or a computer system configured to operate as a telephone communications device, makes a telephone call on a 10 communication line or telephone line to the remote data site. This involves the modem 104 or other communications device dialing the telephone number of the remote data site to establish a telephone connection. As discussed above, the communication line may be a POTS telephone line or an ISDN line, or other type of communication line. The communications line may comprise ordinary telephone wiring, such as two wire twisted pair 15 wiring, coaxial cable, fiber optic cable or other types of transmission media.

After the user telephony communications device connects to the remote data site on the communications line in step 308, in step 312 the user telephony communications device performs data transfers with the remote data site using the communication line. For example, if the remote user is a home user who desires to perform Internet access, and the remote data 20 site is an Internet access provider that provides access to the Internet, the user telephony communications device performs various web browsing or other Internet access functions in response to user input. If the remote user is a telecommuter operating at home and desiring to connect to the corporate LAN, then the user telephony communications device performs various file access or other data access or communications functions with the local area 25 network of the corporate office in response to user input.

While the user is performing data communications on the communication line with the remote data site in step 312, if another party places a telephone call to the remote user using the first telephone number, i.e., the first telephone number assigned to the communications line being used by user telephony communications device, the call 30 forwarding operation performed in step 306 causes the telephone company central office to forward or route the telephone call made to the first telephone number to the second

telephone number, i.e., causes the telephone call to be forwarded or routed to the second telephone number. As noted above, this second telephone number is maintained by the remote data site. The communication server receives the telephone call to the assigned second telephone number and routes this telephone call to the user telephony communications device. This call is received by the user telephony communications device in step 315 on the communication line that is currently being used for data transfers between the user telephony communications device and the remote data site in step 312. Thus the call is received by the user telephony communications device in step 315 in response to the remote data site routing the telephone call to the user telephony communications device instep 320 of Figure 3B.

As discussed above, in one embodiment of the invention, a telephone call provided by the communication server 122 on the communication line to the user telephony communication device operates to ring all other telephone extensions connected to that telephone line. In this embodiment, the location where the user is located includes logic which causes the other extensions to ring when a telephone call is received from the communication server 122 at the remote data site. This embodiment is discussed further below.

20 Figures 6A - 6C: Alternate Embodiment - Remote Data Site Dynamically Assigns Telephone Numbers

Referring now to Figures 6A and 6B, a flowchart diagram illustrating operation of an alternate embodiment of the present invention is shown. Figures 6A and 6B illustrate an embodiment whereby the communication server 122 operates to dynamically assign second telephone numbers to user telephony communication devices which connect to the remote data site. In this embodiment, the user telephony communication device 104A is required to disconnect from the communication line in order to perform the call forwarding operation. As discussed above, the call forwarding operation is performed in order to maintain telephone connectivity while data communications are being performed.

As shown, in step 402 the user telephony communications device connects to the remote data site on a communication line. In step 402 the user telephony communications device makes a telephone call on a communication line or telephone line to a communication server 122 at the remote data site. This involves the user telephony communications device or modem 104 dialing the telephone number of the remote data site to establish a telephone connection.

After the user telephony communications device connects to the remote data site on the communications line, in step 404 the communication server 122 at the remote data site transmits an assigned second telephone number to the user telephony communications device. As discussed above, the user telephony communications device has a first assigned telephone number, which is the main telephone number that is used to dial or call the telephony communications device. For example, if the user is a home user operating at home, the first telephone number is the telephone number assigned to the respective home user, i.e., the telephone number an external party would dial to call the home user's telephone. Thus, after the user telephony communications device connects to the remote data site on the communications line in step 402, the remote data site assigns a second telephone number to the user telephony communications device. This second telephone number is used at the remote data site for call forwarding as discussed below.

In this embodiment, the second telephone number is dynamically assigned on each connection. This differs from the embodiment of Figures 3 - 5, where the second telephone number is statically assigned, and the same second telephone number is used by a respective remote user during each connection to the remote data site. In one embodiment, the one or more communication servers 122 at the remote data site waits a short period of time, for example, five minutes or more, before reassigning a dynamically assigned second telephone number to a new remote user once a prior remote user has been disconnected.

In this embodiment, the one or more communication servers 122 at the remote data site preferably each maintain a plurality of second telephone numbers which are dynamically assignable to remote users, i.e., to user telephony communications devices, which connect to the remote data site. In this manner, the remote data site can maintain a number of second telephone numbers which is far less than the number possible subscribers to the remote data site. This is possible since it is presumed that not every subscriber will desire to connect to

the remote data site at exactly the same time. This also differs from the conventional situation where a home user is required to purchase a second telephone number and pay for this second telephone number twenty-four hours a day, regardless of how often this second telephone number is used. According to this embodiment, the remote data site maintains a plurality of these second telephone lines, and dynamically assigns these telephone numbers to remote users as needed when these users connect to the remote data site. Since not every user will desire to connect to the remote data site at the exact same time, the remote data site can pay for and maintain a much smaller number of second telephone numbers which are dynamically assignable to users who connect to the remote data site. This results in considerable cost savings to each of the remote users who are no longer required to purchase a second telephone number, and in essence only required to pay for the time period that a second telephone number is assigned to the remote user's telephony communications device when the user is connected to the remote data site.

In step 406 the user telephony communications device disconnects from the remote data site. In step 408 the user telephony communications performs a call forwarding operation to call forward telephone calls made to the first telephone number to be forwarded to the second assigned telephone number. In other words, in step 408 the user telephony communication device performs a call forwarding operation which directs that telephone calls that would normally be made to the first telephone number assigned to the remote user should instead be routed to the second telephone number which is being maintained at the remote data site. As noted above, the call forwarding operation may comprise a standard call forwarding operation, such as using "72#", or the operation may comprise use of other telephony features such as call diversion to another number in the case of a busy line.

Once the user telephony communications device has performed this call forwarding operating in step 408, in step 410 the user telephony communications device reconnects to the remote data site on the communication line. Thus, after step 410 has completed, a call forwarding operation has been performed to forward telephone calls made to the first telephone number to the second telephone number at the remote data site, and the user telephony communications device is again connected to the remote data site.

As shown in Figure 6B, in step 412 the user telephony communications device performs data transfers with the remote data site using the communication line. For example,

if the remote user is a home user who desires to perform Internet access, and the remote data site is an Internet access provider that provides access to the Internet, the user telephony communications device performs various web browsing or other Internet access functions. If the remote user is a telecommuter operating at home and desiring to connect to the corporate 5 LAN, then the user performs various file access or other data access or communications functions with the local area network of the corporate office.

Figure 6C - Communication Server Receives Call to Assigned Second Telephone Number

10 While the user is performing data communications on the communication line with the remote data site, if another party places a telephone call to the remote user using the first telephone number, i.e., the first telephone number assigned to the communications line being used by user telephony communications device, the call forwarding operation performed in step 408 causes the telephone company central office to forward or route the telephone call made to the first telephone number to the second telephone number, i.e., causes the telephone 15 call to be forwarded or routed to the second telephone number. As noted above, this second telephone number is maintained by the remote data site. The operations performed by the communications server 122 at the remote data site in steps 413 - 420 of Figure 6C are substantially similar to steps 313 - 320 of Figure 3B.

20 When another party places a telephone call to the first telephone number during the operations of step 412, the remote data site receives a telephone call to the assigned second telephone number in step 413. This telephone call which is forwarded or routed to the assigned second telephone number is received by the communication server 122 located at the remote data site.

25 When the communication server 122A at the remote data site receives a telephone call to an assigned second telephone number in step 413, i.e., a call that has been forwarded or routed to an assigned second telephone number, the communication server 122 examines the data structure in memory in step 414 to determine which user corresponds to the received call. As mentioned above, the communication server 122 dynamically maintains the data 30 structure of assigned second telephone numbers. After determining the appropriate user in step 414, in step 416 the server 122 at the remote data site determines if the user telephony

communications device which has this assigned second telephone number is currently connected to the remote data site.

If the user telephony communications device which has the assigned telephone number is determined to be connected to the remote data site in step 416 when the telephone call to the assigned second telephone number is received, then in step 420 the communication server 122 routes the received telephone call to the user telephony communications device using the communication line that is currently being used for data transfers between the user telephony communications device and the remote data site. The communication server 122 routes the received telephone call to the user telephony communications device as described above.

If the user telephony communications device which has the assigned telephone number is determined to be connected to the remote data site in step 416 when the telephone call to the assigned second telephone number is received, then in step 420 the communication server 122 routes the received telephone call to the user telephony communications device using the communication line that is currently being used for data transfers between the user telephony communications device and the remote data site.

As discussed above, the user telephony communications device includes simultaneous voice and data capabilities. In other words, the user telephony communications device is capable of receiving both voice and data communications on the same communications line at substantially the same time. Thus, the communication server 122 at the remote data site operates to multiplex the telephony voice data onto the communication line that is currently being used for data communications between the user telephony communications device and the communication server 122 at the remote data site. Thus, the remote user can still perform data communications with the remote data site while allowing telephones at the remote user's location to be able to receive telephone calls that were made to the first telephone number, all on a single communications line. This obviates the necessity of the remote user having to purchase a second phone line, since the user can perform data communications with the remote data site while still being able to receive telephone calls.

In one embodiment of the invention, as mentioned above, a telephone call provided by the communication server 122 on the communication line to the user telephony